both from the press and the people. As soon as information can be gathered a full report on the flood will be made.—*I. M. Cline, Forecast Official.*

CHICAGO FORECAST DISTRICT.

Advisory messages were sent out as usual during the month to open ports on Lake Michigan in advance of approaching storms of considerable energy. The most severe storm of the month developed in the Southwest during the 21st, and moved slowly northeastward, reaching Lake Michigan on the 23d–24th. It was accompanied by snow and a westerly gale. Warnings were issued on the morning of the 23d, about twelve hours in advance of the storm; and, as no casualties of any kind were reported, it is probable that vessel masters profited by the advices given.

A cold wave developed in the British Northwest during the night of the 11–12th. Cold-wave warnings were ordered for North Dakota on the 11th, and for South Dakota, Nebraska, Minnesota, and northwestern Iowa on the 12th. The cold wave was practically confined to these limits, although a decided fall in temperature occurred over the greater portion of the district. Another cold wave appeared in the British Northwest on the morning of the 18th, and gradually overspread the entire district, reaching the eastern limits on the morning of the 21st. Ample warnings of its approach were issued; shippers, railroads, and other transportation companies being notified well in advance.—*H. J. Cox, Professor of Meteorology.*

DENVER FORECAST DISTRICT.

Severe weather prevailed in Wyoming and eastern Colorado from the 18th to the 23d, but with this exception the conditions, as regards temperature and precipitation, were such as are commonly noted during March.

The storm of the 18th, which was attended by snow and low temperatures in Wyoming and eastern Colorado, was forecast the preceding morning. This low area, which was persistent in the middle Plateau from the morning of the 12th until the night of the 17th, gave excessive cloudiness and an unusual amount of fog, but very little precipitation. Early in the morning of the 18th warnings of a cold wave, with high winds and snow, were sent to points in Wyoming and northeastern Colorado, and railroad interests were promptly advised. The snowfall was heavy, and being attended by a northerly gale, business and transportation were brought to a standstill, especially in north-central Colorado. The low temperatures that followed were rather severe to range stock interests.—*F. H. Brandenburg, Forecast Official.*

SAN FRANCISCO FORECAST DISTRICT.

The month opened with generally pleasant weather throughout California, quickly followed by a moderate storm over the northern portion of the State. Southwest storm warnings were displayed at Point Reyes at 8 p. m. on the 2d, but were not verified. Warnings of high southerly winds were sent to stations in Nevada and southern California; high winds prevailed on the 3d and the warnings must be considered as late. A moderate depression over the Sierra caused general rains in California and snow in Nevada; in the vicinity of Los Angeles unusually heavy rains fell. Heavy frost occurred on the morning of the 6th. Another disturbance prevailed on the coast on the 8th, and was also accompanied by generous rains throughout the entire State. Southeast storm warnings were displayed from Point Reyes to Eureka, and were verified, high southerly winds prevailing along the coast. On the 12th a rainfall of 2.32 inches was reported at Eureka. A marked disturbance prevailed over California and Nevada on the 13th; rain fell over the entire State and thunderstorms occurred in the interior. The weather continued unsettled and showers fell on nearly every day in some portion of the State. A hailstorm occurred at San Francisco on the 16th. From the 17th to the 21st the weather was fair. Another disturbance appeared over Nevada on the 23d and, as in previous cases, was accompanied by general rain. At Los Angeles a rainfall of 3.32 inches was reported for the twenty-four hours ending 5 a. m., 25th. The weather continued unsettled during the rest of the month. Southeast storm warnings were displayed from Point Lobos on the 27th, and were verified. The month as a whole was an unusually stormy one; the rainfall much exceeds that of an average March. No serious frosts occurred and the damage to fruits was slight.—*A. G. McAdie, Professor.*

PORTLAND, OREG., FORECAST DISTRICT.

The storms of March passed inland farther south than usual and only one severe storm visited the North Pacific States during the month. It made its appearance over western British Columbia on the morning of the 9th, and storm warnings were immediately ordered at all stations in the district. The gale reached its height about twenty-four hours later, when maximum velocities of 90 miles at North Head and 68 miles at Tatoosh Island were recorded. Other storms occurred on the 6th, 26th, and 30th, for which warnings were displayed in time to be of benefit. Frosts were reported quite frequently during the last half of the month and were accurately forecast.—*E. A. Beals, Forecast Official.*

AREAS OF HIGH AND LOW PRESSURE.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocity.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	27, a. m*.	51	114	4, a. m..	48	54	4,200	5.0	840	35.0
II	2, p. m..	50	110	7, p. m..	46	60	2,650	5.0	530	22.1
III	6, p. m..	38	122	10, a. m..	46	60	3,400	3.5	971	40.4
IV	8, p. m..	41	124	12, p. m..	39	75	2,925	4.0	731	30.5
	9, a. m..	51	114				2,500	3.5	714	29.8
V	11, p. m..	54	114	16, a. m..	46	60	2,800	4.5	622	25.9
VI	17, p. m..	54	114	23, p. m..	46	60	4,100	6.0	683	28.4
VII	21, a. m..	51	120	26, p. m..	35	76	3,100	5.5	564	23.5
VIII	26, a. m..	53	108	30, a. m..	46	60	2,800	4.0	700	29.2
Sums							28,475	41.0	6,355	264.8
Mean of 9 paths							3,164		706	29.4
Mean of 41.0 days									694	28.9
Low areas.										
I	4, p. m..	39	120	8, a. m..	39	85	2,700	3.5	771	32.1
II	17, a. m..	38	114	20, p. m..	45	80	2,375	3.5	678	28.2
III	22, a. m..	29	95	23, a. m..	38	80	1,100	1.0	1,100	45.8
IV	23, p. m..	45	88	25, a. m..	48	68	975	1.5	650	27.1
V	28, a. m..	48	123	31, p. m..	46	60	3,000	3.5	857	35.7
VI	28, p. m..	25	82	31, p. m..	46	60	2,000	3.0	667	27.8
Sums							12,150	16.0	4,723	196.7
Mean of 6 paths							2,025		787	32.8
Mean of 16.0 days									759	31.6

*February.

For graphic presentation of the movements of these highs and lows see Charts I and II.—*Geo. E. Hunt, Chief Clerk, Forecast Division.*

RIVERS AND FLOODS.

The river conditions during March were exceptional and noteworthy, and the month will always be memorable for the general character and widespread extent of its floods. While the precipitation was not excessive, except in Louisiana and southeastern Texas, yet its periodic distribution was such that

floods, many of them dangerous and destructive, occurred over all watersheds east of the Rocky Mountains, except the Missouri, the upper Mississippi, and those of New England. The abnormally high temperatures (the average excess ranging from 3° to 12°) also contributed very materially to the flood production: The snows were quickly melted, adding their volume to the rainfall, and there was an absence, after the heavy rains, of the cold waves which are usually depended upon to check the rise of flood waters. It is also apparent that the proportion of run-off to rainfall was greater than usual, as the heavy and general rains of February had left the ground in such a thoroughly saturated condition that comparatively little of the succeeding March rains was absorbed.

The great flood in the lower Mississippi continued throughout the month, attaining higher stages than were ever before recorded. A full description of this flood, and those of the great tributary streams, the Ohio, Tennessee, Arkansas, and Red, will be published at a later time.

The Wisconsin River was in flood during the second half of the month, as a result of the high temperatures and copious rains from the 16th to the 20th, and warnings were issued for the first time to towns along the river. Flood warnings along the Wisconsin River are of peculiar importance owing to the fact that comparatively low stages can cause great damage. In the vicinity of Portage, Wis., for instance, the Wisconsin and Fox rivers are but a mile or two apart, and levees have been constructed to prevent the waters of the former river from flooding the Fox River Valley. These levees will retain but 12 feet of water, and the maximum stage reached at Portage during this flood was 11.1 feet. The value of the flood warnings is evident.

The flood of March 1 in the Pittsburg River district was caused by the heavy rains of February 28, and the following report thereon was made by Mr. A. McC. Ashley, official temporarily in charge of the United States Weather Bureau office at Pittsburg:

On the morning of February 28 the 8 a. m. reports from the Allegheny and Monongahela stations showed that a heavy rain, averaging about one inch, had fallen on both watersheds during the preceding twenty-four hours and that both the main streams and their numerous tributaries were rising rapidly. Special reports were called for from all up river stations, and it was announced on the weather map that from the reports already received a stage of over 20 feet was indicated inside of twenty-four hours.

With the turn of the barometer following the passage of the storm area that had caused the rain, this section was struck, about 11 a. m., by a violent northwest wind squall which prostrated telegraph lines in all directions and seriously interfered with the receipt of special reports. No reports at all came through from Warren, Clarion, or Brookville, Pa., until the next day, and all other special reports were delayed from one to six hours. The reports from Parker were of little value because an ice gorge, which broke shortly after 8 a. m., had raised the Allegheny at that place to an abnormally high stage at 8 a. m., and with the passing out of the ice, the Parker stage decreased steadily all day. When it is recalled that the Allegheny delivers twice as much water as the Monongahela, under similar conditions, the difficulties under which we labored will be appreciated.

At 5:15 p. m. the police departments of both cities were informed that the water would at least reach a 24-foot stage at Pittsburg early the following morning, but that as both rivers were still rising at headwaters, an even higher stage was probable, and that all interests likely to be affected should keep in touch with this office. This information was spread from house to house along the river fronts by the police and was also bulletined in the windows of the newspaper offices. Washington was notified by telegraph.

At 9:30 p. m. a final forecast was issued predicting a stage of from 26 to 28 feet by 8 a. m. of March 1, and all interests affected by 29 feet of water were advised to make preparations for that stage.

At 9:30 a. m., of March 1, telegrams were forwarded to all displaymen in the Wheeling section to the effect that a stage of from 40 to 42 feet was probable in the Ohio at that point by the following morning. The crest stage was 40.2 feet or 4.2 feet above the danger line.

On the morning of March 1 the Monongahela, from headwaters to Lock No. 4, had begun to fall, but the Allegheny was still rising slowly at all points. Before we received the regular 8 a. m. reports the Western Union offices along the Allegheny had been closed, it being Sunday, and it was impossible to secure specials during the day. We were then compelled to depend entirely upon the rate of rise at Herrs Island Dam in advising local interests during Sunday, but we assured all who called that the crest would not be above 29 feet on the Pittsburg gage.

The following record of observations, in feet, will indicate the accuracy of the warnings disseminated:

Pittsburg gage: February 28, 8 a. m., 7.9; 12 noon, 12.0; 2 p. m., 14.0; 4 p. m., 16.0; 6 p. m., 17.5; 8 p. m., 20.0; 10 p. m., 22.0; 12 midnight, 23.7. March 1, 2 a. m., 24.9; 4 a. m., 25.8; 6 a. m., 26.8; 8 a. m., 27.5; 10 a. m., 28.0; 12 noon, 28.4; 2 p. m., 28.8; 3 p. m., 28.9, crest; 4 p. m., 28.9, crest; 5 p. m., 28.9, crest; 6 p. m., 28.9, crest. March 2, 8 a. m., 25.5; March 3, 8 a. m., 17.5.

Wheeling gage: February 28, 8 a. m., 13.0; March 1, 8 a. m., 28.6; March 2, 8 a. m., 39.7; March 2, noon, 40.2, crest; March 3, 8 a. m., 37.3; March 4, 8 a. m., 27.5.

A conservative newspaper estimate places the local loss at about $100,000, more than half of this amount representing the wages of men temporarily thrown out of employment, and the balance the injury to buildings and fixed machinery by mud and water. The newspapers also state that owing to the timely warnings given out by the Weather Bureau all movable property in the low lying districts was removed to a place of safety in advance of the rise of the water.

The New England rivers, and particularly the Connecticut, were at fairly high stages during the latter portion of the month. The general rains over the watersheds from the 21st to the 25th were responsible for the rise in the Connecticut. A stage of 32.8 feet was reached at Wells River, Vt., on the 24th, and one of 23.3 feet at Hartford, Conn., two days later, not sufficiently high, however, to cause any damage.

There were three freshets in the Hudson and Mohawk rivers; one on the 1st and 2d, when the ice went out; one from the 10th to the 14th, and one from the 23d to the 26th. The two latter were caused by the heavy rains that occurred within the days mentioned. During these freshets the increased facilities for the reception and dissemination of flood reports from the center at Albany were put to a practical test for the first time. Frequent reports were received from the substations and warnings issued whenever necessary. They were accurate and timely and were well received by all interested. Many commendatory notices were received regarding the new service and its benefits.

Conditions along the Susquehanna River became threatening on the 9th and again on the 23d, necessitating the issue of warnings for moderate flood stages. The maximum stage reached was 24.4 feet at Wilkesbarre, Pa., 5.4 feet above the danger line. No damage of consequence was reported.

Nothing of interest occurred along the Potomac, although there were sharp rises on the 1st, and from the 23d to the 25th, caused by the same stormy conditions that produced the floods both to the northward and southward.

There were two freshets in the James River; one on the 2d that caused a 12-foot stage at Richmond, Va., without damage, as due notice had been given, and another on the 24th and 25th, of which the following report was made by Mr. R. F. Young, official temporarily in charge United States Weather Bureau office, Richmond, Va.:

Reports of heavy rainfall were received from Buena Vista on the 22d and river and rainfall messages from Lynchburg and Columbia on the morning of the 23d. Based on the information contained in these reports, advisory warnings were issued at 10 a. m. for a 12-foot stage locally and for Norwood and Scottsville, to be reached during the next twenty-four hours.

In the afternoon messages were received from Buchanan, Buena Vista, Charlottesville, and Columbia, which indicated a higher stage than that named in the first warning, and at 9 p. m. a second warning was issued for a stage of 15 feet to occur on the afternoon of the 24th. On the morning of the 24th the information was given out to the steamship companies and others interested that the water would remain high during the 25th; again on the morning of the 25th a bulletin was issued stating that there would be a second rise during the late afternoon or night to about the same stage as on the 24th, and that the water would fall slowly during the 26th. All the above information was promptly and effectually distributed and was the means of preventing loss and much inconvenience to the steamship companies and other business interests along the river. All property subject to damage was removed during the 23d and no loss was sustained except the expense of such removal.

Several vessels of the Old Dominion Steamship Company and the Clyde Line were detained at Norfolk for several days on account of the flood;

the agents were kept informed twenty-four to thirty-six hours in advance as to the time the water would leave their wharfs sufficiently to permit of unloading vessels. The wharfs remained submerged until late in the afternoon of the 26th.

The gage readings during the four days covered by the freshet were as follows: 23d, 8 a. m., 7.5 feet; 12:30 p. m., 9.2 feet; 6 p. m., 10.8 feet; midnight, 12.0 feet (unofficial); 24th, 8 a. m., 12.7 feet; noon, 13.0 feet; 6:30 p. m., 13.2 feet; 10 p. m., 13.9 feet (unofficial); 25th, 8 a. m., 13.0 feet; 1:45 p. m., 13.1 feet; 6:30 p. m., 13.2 feet; 11 p. m., 14.0 feet (unofficial); 26th, 8 a. m., 12.5 feet; 1:45 p. m., 10.5 feet.

The floods in the Roanoke and Cape Fear rivers passed off without unusual incident, although they rose above the danger lines at all points. At Weldon, N. C., on the Roanoke River, the maximum stage was 42.7 feet on the 26th, 12.7 feet above the danger line, and at Fayetteville, N. C., on the Cape Fear River, it was 50.5 feet, 12.5 above the danger line. Warnings were issued on the 22d for danger-line stages, and on the 23d for dangerous rises that would flood lowlands, etc. Warnings were also issued on the 30th for a moderate flood in the rivers of eastern North Carolina as a result of the heavy rains of the 29th.

The behavior of the rivers of South Carolina was described as follows by Mr. L. N. Jesunofsky, Official in Charge of the United States Weather Bureau office at Charleston, S. C.:

The streams in South Carolina were at abnormally high stages during March, 1903. The flood waters in the upper streams during February 22, 23, 24, and 25 did not reach Smiths Mills, on the lower Pedee, and St. Stephens, on the Santee, until the 6th and 7th of March, respectively, as correctly forecast.

The flood periods on the Wateree, the upper Pedee, and the Congaree were as follows: 1st to 2d, 22d to 25th, and the 30th and 31st. On the lower Pedee and the Santee they were as follows: 6th to 9th, and 28th to 31st. The freshets from the upper Pedee at Cheraw, S. C., were not expected at Smiths Mills until April 10; the flood waters from the Wateree, at Camden, and the Congaree, at Columbia, on the 30th and 31st were not due to reach the Santee, at St. Stephens, until April 10 or 11.

There was a rise of 15.0 feet in the Wateree River at Camden during the 1st and 2d, to a gage reading of 27.0 feet, or 3.0 feet above the danger line, on the 2d. The stream again rose rapidly from 8.5 feet on the 21st to 30.4 feet, or 6.4 feet above the point of danger, on the morning of the 25th, and began to recede during the early morning of the 26th. Heavy precipitation in the upper catchment basin of the Wateree, during the night of the 29th, caused a rise at Camden of 13.6 feet during the 30th and 31st, to a gage reading of 27.6 feet, or 3.6 feet above the danger point, by 8 a. m. of the 31st.

The Pedee, at Cheraw, rose 18.9 feet on the 1st and 2d, with but little drift in the stream. The greatest and most pronounced rise occurred during the 22d, 23d, and 24th. On the morning of the 21st the gage registered 5.8 feet; by 8 a. m. of the 24th the water reached a reading on the gage of 33.8 feet, or 6.8 feet above the danger line, a rise of 28.0 feet in seventy-two hours. Drift was running heavily during the 23d and 24th. The stream remained practically stationary during the 25th and 26th; receded 6.7 feet late during the night of the 26th to the danger line of 27.0 feet by the 8 a. m. observation of the 27th. There was a further rapid decline in the Pedee at Cheraw during the 28th, 29th, and up to noon of the 30th, when the stream began to rise rapidly, reaching at 8 a. m. of the 31st a gage reading of 26.2 feet, or within 0.8 foot of the danger point.

A rise of 10.2 feet was recorded at Columbia during the night of February 28 and the morning of March 1 at a stage of 14.0 feet, or within 1.0 foot of the danger line. The stream rose 21.5 feet, from a gage reading of 2.4 feet on the 21st to 23.9 feet, or 7.9 feet above the danger point, at 6 p. m. of the 24th. There was a rapid decline during the 26th, 27th, and 28th; on the afternoon of the 29th the stream began to rise slowly; during the night of the 29th and morning of the 30th it rose 12.5 feet to 16.0 feet, or 1.0 foot above the point of danger. There was an additional rise of 3.4 feet to a gage reading of 19.4 feet, or 4.4 feet above the danger point, at 8 a. m. of the 31st.

The flood waters at Cheraw, on the upper Pedee, during the 22d, 23d, 24th, and 25th, reached Smiths Mills, on the lower Pedee, by the 31st, and produced a rise of 5.2 feet, during the 28th, 29th, 30th, and 31st, to a gage reading of 17.9 feet, or 1.9 feet above the danger point, by the morning of the 31st.

The freshets at Camden, on the Wateree, and at Columbia, on the Congaree, on the 22d, 23d, 24th, and 25th, passed St. Stephens, on the Santee, seaward, on the 29th, 30th, and 31st, raising that stream 6.6 feet, to a reading of 15.6 feet, or 3.6 feet above the danger line, by 8 a. m. of the 31st.

No damage by the floods occurred so far as heard from, except the drowning of a few head of stock. The month throughout was highly favorable to the lumber interests. The freshets were forecast with a fair degree of accuracy. Navigation was uninterrupted and steamers carried more than the usual amount of freight.

The floods in the Georgia rivers were not of serious character, although stages above the danger lines were noted at many places from the 23d to the 25th. Warnings were issued at the proper time from the centers at Atlanta, Augusta, and Macon, Ga., and reports have been received showing that property in the latter district to the amount of perhaps $50,000 was saved by the warnings, although the maximum stage of water recorded at Macon was but 19 feet, 1 foot above the danger line.

The floods in the rivers of Alabama were caused by the heavy rains of February 27 and 28, in the Southern States, and the maximum stages were reached during the first five days of March. Warnings were issued on February 28, and, as usual, were well verified by the subsequent events. The floods, however, were not of grave character.

The following report on the floods in the rivers of Texas was made by Mr. E. H. Bowie, Official in Charge of the United States Weather Bureau office at Galveston, Tex.:

Within the time covered by the records of the Bureau for the State of Texas the winter rains have never before been so frequent and excessive as during the current season. All out door work was practically abandoned during the months of December, January, and February on account thereof, and in many sections railway traffic was seriously interfered with on account of spreading road beds and other conditions dangerous to life and property. These frequent and excessive rains culminated in a veritable downpour over practically the entire State on the 25th and 26th and immediate rapid rises of the water in the already overburdened river channels. The rainfall, in inches, for these dates for several of the observation stations in the State is shown by the following table. (See report of the Texas section of the Climate and Crop Service for February, 1903.)

The morning reports of March 26 showed excessive rains, and special river observations showed the following stages: Kopperl, 10 feet; Waco, 20.2 feet, and Booth, 21 feet. On this information and the known excessive rainfalls the following warning was issued:

"Excessive rains have fallen over the entire drainage area of Brazos River within the past thirty-six hours. Rapid rise in Brazos and tributaries to and above danger line at all points from Waco north within the next thirty-six hours. Heavy rise will continue at Waco and points south during several days. Flood stages probable at practically all points on Brazos River and tributaries. Heavy rises in Colorado and Trinity rivers also indicated. Please disseminate information for benefit of public."

This information was immediately disseminated by telegraph and mail and through the cooperation of the Southwestern Telephone and Telegraph Company to all sections that were thought liable to overflow.

The river at Kopperl rose to a maximum height of 12 feet on the day that the warning was issued; the rise at Waco was very rapid, from a stage of 13.2 feet the morning of the 26th to 27 feet during the early morning of the 27th, which stage was 3 feet above the danger line. South of Waco, in consequence of the large amount of water emptied into the Brazos by its principal tributaries, the rise was very rapid and prolonged for several days and the area flooded was somewhat greater than that of July, 1902. The flood crest moved slowly southward and passed Booth March 7, with a stage of 38.7 feet at that point.

Railroads traversing the Brazos Valley were forced to suspend traffic for several days owing to high water, and all roads were more or less affected thereby. A number of bridges were destroyed by the floods on the smaller rivers, and in some instances minor losses of stock occurred. The loss of stock and movable property was unquestionably minimized by the timely receipt of the warnings.

The floods were more or less general in other Texas rivers, the rises in the San Antonio, Guadalupe, Colorado, Trinity, Neches, and Sabine causing extensive inundation of lowlands and some loss of stock and movable property.

The rivers of the Pacific coast rose steadily during the month, but no high stages were reached except in the lower Sacramento River where the danger line was touched on the last day of the month. As the annual rise of the Columbia River is of special interest at this time, it is thought that a brief discussion of this subject will prove of value. The following article was prepared by Mr. E. A. Beals, Forecast Official in Charge of the United States Weather Bureau office at Portland, Oreg., and was first printed in the report of the Oregon section of the climate and crop service for March, 1903:

Reports from the headwaters of the Columbia and Snake rivers are to the effect that there was more snow in the mountains at the end of March than usual. The snow came early and was heavy during December and January, but light in February and March. It packed solid early in the season which insures slow melting, and abundant water for irrigation purposes is anticipated during the coming spring and summer in eastern Oregon, eastern Washington, and Idaho.

The annual rise in the lower Columbia River depends largely upon the temperatures during April and May. There is always snow enough in the mountains to cause a flood, provided it melts quickly, but estimates as to the probable spring rise must necessarily be empirical in character. In 1900 the high water at Portland, Oreg., was 17.8 feet on May 20. The snowfall that year was quite light over the entire drainage area. In 1901 the highest stage at Portland, during the spring rise, was 20.8 feet on June 3, and the snowfall was about the same as the year before, the higher water of 1901 being due to a backward spring. In 1902 the highest water at Portland was 20.8 feet on June 4, which is the same as the previous year, and it occurred on nearly the same date. The snowfall during the winter of 1901–02 was considerably heavier than during the preceding winter, and the spring was also backward. The reason that the water did not reach a higher stage is due to the fact that the melting of the snow was interrupted by several cool spells which checked the rise at high stages, and although the volume of water which passed out to sea was greater than in the previous year, the flood crest was no higher.

Many of those reporting the depth of snow in the mountains this year have stated the amount to be about the same as during the winter of 1898–99. The high water following at Portland that season was 24.2 feet on June 23. It is thought that with normal conditions during April and May the flood crest at Portland this year will reach a stage of 24 feet about the middle of June. Should the melting be rapid and continue uninterruptedly the stage will be somewhat higher than 24 feet, but with marked cool spells intervening the stage will be a foot or two lower than the foregoing estimate. A stage of 24 feet at Portland necessitates a stage of about 43 feet at The Dalles, and 25 feet at Umatilla.

The ice was entirely out of the rivers by the 27th of the month, that in the Red River of the North being the last to go. In the upper Mississippi River the time of breaking up was a few days later than in 1902. No ice was reported below Keokuk, Iowa. Navigation for short trip boats was opened at Keokuk on the 16th, and at La Crosse, Wis., on the 21st.

The Penobscot River opened on the 12th, but running ice was reported as late as the 25th. The upper Merrimac and upper Connecticut opened about the 8th, and the ice passed down without causing any damage. The last ice in the Connecticut River reported was at Hartford, Conn., on the 10th.

The highest and lowest water, mean stage, and monthly range at 171 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Forecast Official.*

CLIMATE AND CROP SERVICE.

By Mr. JAMES BERRY, Chief of Climate and Crop Service Divison.

The following summaries relating to the general weather and crop conditions during March are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau; they are based upon voluntary reports from meteorological observers and crop correspondents, of whom there are about 3000 and 14,000, respectively:

Alabama.—The first part of March was continuously wet, the latter part, until the rain of the 29th, being more favorable. Farm work was very much delayed, though considerable corn was planted in uplands, some corn being up before the 31st. Very little cotton was planted. Wheat and oats made very good progress. In northern districts peaches that escaped the February freeze were killed by frosts of 25–26th, but in southern sections fruit was only slightly injured.—*F. P. Chaffee.*

Arkansas.—Rains and high waters during the first half of the month delayed farm work; weather and condition of soil, except in overflowed districts, more favorable during last half, and rapid progress had been made in the uplands, but the lowlands were not in condition to work. Very little preparation made for cotton planting. Upland wheat better than usual; that in lowlands suffered considerable damage. Very few oats sown. Some Irish potatoes planted. Peach crop will be short, though not a total failure. There promised to be an abundance of apples and small fruits.—*Edward B. Richards.*

Arizona.—The temperature was considerably below normal in the northern division and slightly below normal in the southern and western divisions. Good rains fell during the month over most of the territory, but the heaviest rains occurred generally toward the close of the month, and irrigation canals were running full of water. The cool weather retarded the growth of vegetation somewhat, but the favorable conditions of moisture largely overcame the effect of cold weather, and crops generally were in a promising condition at the end of the month. Feed on the ranges was generally good, and cattle were in fair to good condition.—*M. E. Blystone.*

California.—The warm weather and well-distributed rainfall during the month were very beneficial to all growing crops, and there was little injury to young fruit by frost. Deciduous fruit trees were in full bloom at the close of the month and gave promise of a heavy yield. Wheat, barley, oats, and grass made rapid growth and were in excellent condition. The grain acreage is larger than usual.—*G. H. Willson.*

Colorado.—Season backward; soil in good condition and plowing general the last week of the month. Seeding wheat, oats, spring rye, barley, and alfalfa well advanced in southern counties. Fruit trees somewhat damaged by February freeze and some pruning necessary. Garden planting begun. Range poor but starting nicely. Outlook unusually favorable for good and prolonged flow of water in Rio Grande; from other watersheds early flow promised to be much better than last year's, but late flow less than usual, if not augmented by rainfall.—*F. H. Brandenburg.*

Florida.—Warm weather with frequent rains characterized the month. The excessive rains were more or less disastrous to the vegetable crop over the southern part of the State, where the yield of tomatoes will be less than one-half of former years. The wet weather damaged or delayed all crops on lowlands. Much corn was replanted. On uplands the conditions were more favorable. Corn made fair progress and melons were doing well. Citrus trees and pineapples were very satisfactory.—*A. J. Mitchell.*

Georgia.—Prominent features of the month were high temperature, cloudiness, and frequent rains. There was a general absence of freezing temperature, the month, with one exception, was the warmest March since 1891. The precipitation in the northern sections was heavy, but in a few southwestern counties it was below the average. Excessive moisture proved detrimental to farm work, plowing for corn and cotton and the planting of these crops being much hindered. The peach crop was seriously damaged by the cold wave in February.—*J. B. Marbury.*

Idaho.—Weather conditions favorable for farm work prevailed during March, and the month was nearly normal as to temperature and precipitation. The winter weather was unfavorable for growth of grass on the stock ranges, but winter wheat was protected by snow and was in fine condition. There were heavy losses of sheep where not fed to hay and grain. The entire surplus hay crop has become exhausted. Fruit trees were in exceptionally healthy and vigorous condition.—*S. M. Blanford.*

Illinois.—In the northern district the weather was unseasonably warm, and the growth of grasses and meadows was greatly stimulated. Farm work was retarded on account of the soggy condition of the soil. The wheat crop in the central district was promising; in the southern district its condition was good, but somewhat uneven. Peach buds were seriously injured over the entire State, and probably killed in the central and northern districts.—*Wm. G. Burns.*

Indiana.—Wheat, rye, and clover were in excellent condition, except that a small acreage of wheat sown prior to September 25 showed effect of flies, and a small acreage was damaged by recent floods, and except, also, that clover was slightly injured in a few localities by alternate freezing and thawing. Plowing, sowing oats and clover, planting potatoes, and making gardens began.—*W. T. Blythe.*

Iowa.—The month was warm, with excess of cloudiness and fog, causing the frost to thaw rapidly. The saturated condition of the soil and lack of drying weather rendered field work impracticable except in very dry and sandy soil. Grass started early, and all fall sown crops came through the winter in excellent condition. Farm stock were generally thrifty.—*John R. Sage.*

Kansas.—A warm March, many fogs, and less wind than usual. Ground wet, retarding farm work. Wheat in good condition, an even stand, and growing well. Some oats sown. Rye doing well. Early peaches, apricots, and plums beginning to bloom in the south.—*T. B. Jennings.*

Kentucky.—Wheat was in excellent condition and very forward, and the outlook was decidedly promising. Winter oats and rye doing well. The sowing of spring oats progressing. Tobacco beds sown late on account of wet weather. Very poor prospect for peaches, many killed by freezes in February and latter part of March; hardy varieties will probably bear. Other fruits doing well. Grass in fine condition and stock doing well. Farm work much delayed by rain.—*H. B. Hersey.*

Louisiana.—Farming operations were materially interfered with by wet weather during the first and second decades of the month. More